Treatment of Deep Bite Using Clear Aligner Therapy

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UNIVERSITY OF THE PACIFIC
Arthur A. Dugoni School of Dentistry

CRIL
Craniofacial Research Instrumentation Laboratory

BACKGROUND

Deep bite is a type of malocclusion that can lead to problems with biting, chewing, speech, and has the potential to damage teeth and gums. While conventional orthodontic treatments, like fixed appliance, have been shown to be effective in addressing this condition[1,2,3], the use of clear aligners for this purpose has not been fully explored in the current scientific literature.

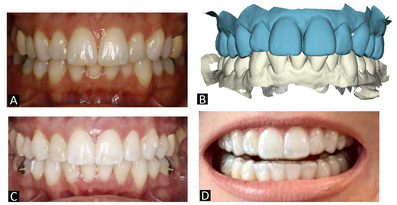

Fig 1. Deep bite patient. A- Initial Intra oral photo; B. Digital Dental Models; C-Final treatment and D-Patient wearing the appliance

OBJECTIVES

The objective of this retrospective longitudinal study is to evaluate the treatment effects of clear aligners in patients with deep bite malocclusion by examining the dental and skeletal changes between the initial and final treatment time points. Our null hypothesis states that there are no significant differences between the two-time points for the variables studied.

MATERIAL AND METHODS

IRB APPROVAL: This study was approved by the IRB of the University of the Pacific (UoP), number: IRB: 2022-53

SAMPLE: 18 patients were included, with an average of 30 years old +/- 12. The average treatment time was 23 months +/- 12 months.

Methods: Lateral cephalometric radiographs and digital models were measured and analyzed at two timepoints: before treatment (T1) and after treatment (T2). Measurements included conventional cephalometrics, Curve of Spee, intermolar distance, intercanine distance, molar and canine classification, overbite, and overjet.

DIGITAL DENTAL MODEL MEASUREMENTS AND SOFTWARE

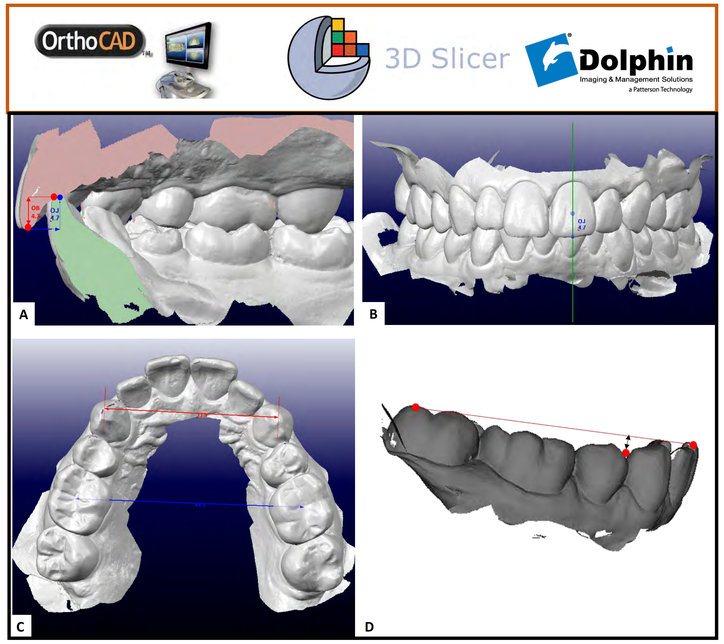

Fig 2. Software used in the research (top). A- Measurement of OJ and OB; B- Frontal view for observing the deep bite; C- Oclusal view showing the intercanine and intermolar distances and D- Measurement of the Curve of Spee

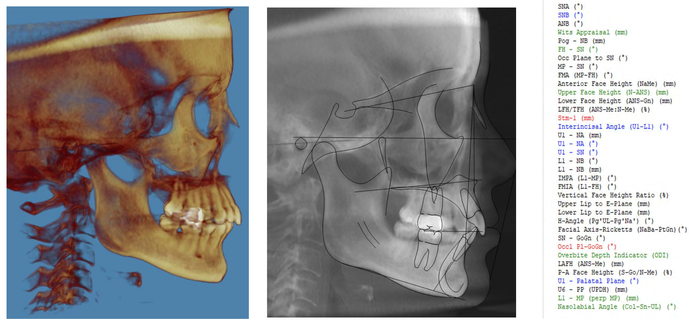

Fig 3. CBCT from the patient (left); Lateral x-rays were created from the CBCT (middle) and the cephalometric measurements were obtained (right).

RESULTS AND DISCUSSION

A total of 1928 clear aligner patients were screened, and after applying inclusion and exclusion criteria, 18 patients were evaluated for changes in their clear aligner treatment. Our null hypothesis was rejected, specifically, the measurements taken at T1 and T2 revealed statistically significant differences ($p<0.05$) in the SNA, interincisal angle, occlusal plane, and L1-NB

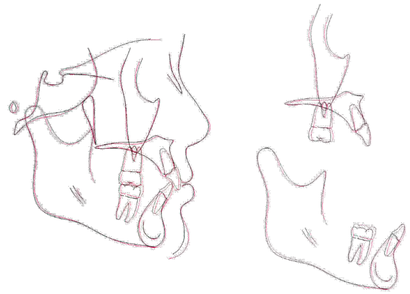

Fig 4. Lateral cephalometric tracing with before and after treatment, black and red lines respectively on the cranial base superposition (left), and in the right illustrating maxillary and mandibular dental changes of orthodontic therapy./

	Mean	SD	SE	Lower	Upper	p-value
SNA (T2) - SNA (T1)	-0.42	0.76	0.18	-0.80	-0.04	0.031
SNB (T2) - SNB (T1)	-0.17	0.81	0.19	-0.57	0.23	0.379
ANB (T2) - ANB (T1)	-0.25	0.73	0.17	-0.61	0.11	0.165
Wits Appraisal (mm) (T2) - Wits Appraisal (mm) (T1)	-1.27	1.66	0.39	-2.10	-0.45	0.005
Pog - NB (mm) (T2) - Pog - NB (mm) (T1)	0.01	0.09	0.02	-0.04	0.05	0.790
FH - SN (T2) - FH - SN (T1)	0.21	0.62	0.15	-0.10	0.51	0.176
Occ Plane to SN (T2) - Occ Plane to SN (T1)	1.66	1.58	0.37	0.88	2.45	0.000
MP - SN (T2) - MP - SN (T1)	0.34	0.82	0.19	-0.07	0.75	0.097
FMA (MP-FH) (T2) - FMA (MP-FH) (T1)	0.13	0.72	0.17	-0.23	0.48	0.460
LFH (ANS-Gn) (mm) (T2) - LFH (ANS-Gn) (mm) (T1)	-0.02	1.17	0.28	-0.60	0.56	0.952
Int Inc Angle (U1-L1) (T2) - Int Inc I Angle (U1-L1) (T1)	-5.81	9.68	2.28	-10.62	-0.99	0.021
U1 - NA (mm) (T2) - U1 - NA (mm) (T1)	0.57	1.23	0.29	-0.04	1.18	0.064
U1 - NA (T2) - U1 - SN (T1)	-80.12	5.96	1.41	-83.08	-77.15	0.000
L1 - NB (T2) - L1 - NB (T1)	3.60	5.89	1.39	0.67	6.53	0.019
L1 - NB (mm) (T2) - L1 - NB (mm) (T1)	0.77	1.26	0.30	0.15	1.40	0.018
IMPA (L1-MP) (T2) - IMPA (L1-MP) (T1)	3.42	6.02	1.42	0.43	6.41	0.027
ODI (T2) - ODI (T1)	-0.36	0.96	0.23	-0.84	0.11	0.127
U1 - Palatal Plane (T2) - U1 - Palatal Plane (T1)	2.35	5.24	1.24	-0.26	4.96	0.074
U6 - PP (UPDH) (mm) (T2) - U6 - PP (UPDH) (mm) (T1)	-0.15	0.61	0.14	-0.45	0.15	0.311
L1 - MP (perp MP) (mm) (T2) - L1 - MP (perp MP) (mm) (T1)	-1.19	1.29	0.30	-1.83	-0.55	0.001
Avg OJ T2 - Avg OJ T1	-0.97	1.06	0.25	-1.50	-0.45	0.001
Avg OB T2 - Avg OB T1	-1.44	1.53	0.36	-2.20	-0.68	0.001
IC Upper T2 - IC Upper T1	0.38	1.61	0.38	-0.42	1.18	0.332
IC Lower T2 - IC Lower T1	1.63	2.49	0.59	0.39	2.87	0.013
IM Upper T2 - IM Upper T1	0.65	1.08	0.26	0.11	1.19	0.021
IM Lower T2 - IM Lower T1	1.02	1.33	0.31	0.36	1.69	0.005
Curve of Spee T2 - Curve of Spee T1	-0.85	1.20	0.28	-1.45	-0.26	0.008

Table 1. Lateral Cephalmetric measruement anaylsis. T-test comparing the mean at T1 to that of T2; p-values in red illustrates statistical signficance iin the measurements

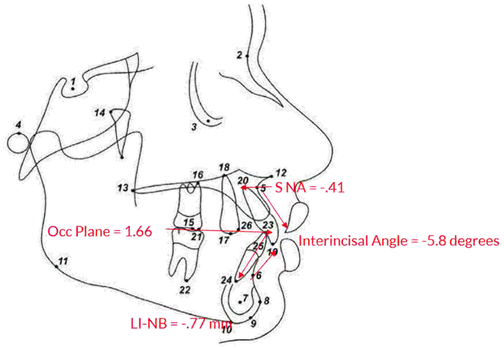

Fig 5. Summary of Lateral cephalometric tracing illustrating four measurements that had p-values <0.05 illustrating dental and skeletal changes after clear aligner therapy.

CONCLUSION

This study demonstrates that clear aligner treatment can effectively improve dental alignment and correct deep bite malocclusion. Clear aligner therapy has the ability to correct deep bite through incisal intrusion with small changes in posterior changes. It is also worth noting that the primary means of correction was through incisal inclination, as opposed to other types of tooth movement.

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Background:
Deep bite is a type of malocclusion that can lead to problems with biting, chewing, speech, and has the potential to damage teeth and gums. While conventional orthodontic treatments have been shown to be effective in addressing this condition, the use of clear aligners for this purpose has not been fully explored in the current scientific literature.

Objective:
The objective of this retrospective longitudinal study is to evaluate the treatment effects of clear aligners in patients with deep bite malocclusion by examining the dental and skeletal changes between the initial and final treatment time points. Our null hypothesis states that there are no significant differences between the two-time points for the variables studied.

Method:
The patient selection included males aged 18 and above, and females aged 16 and above, with overbite greater than 4 mm, and classified as hyperdivergent/normal or hypodivergent. Both lateral cephalometric radiographs and digital models were measured and analyzed at two timepoints: before treatment (T1) and after treatment (T2). Measurements included conventional cephalometrics, Curve of Spee, intermolar distance, intercanine distance, overbite, and overjet.

Results:
A total of 1928 clear aligner patients were screened, and after applying inclusion and exclusion criteria, 18 patients were evaluated for changes in their clear aligner treatment. Our null hypothesis was rejected, specifically, the measurements taken at T1 and T2 revealed statistically significant differences ($p<0.05$) in the SNA, interincisal angle, occlusal plane, and L1-NB.

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